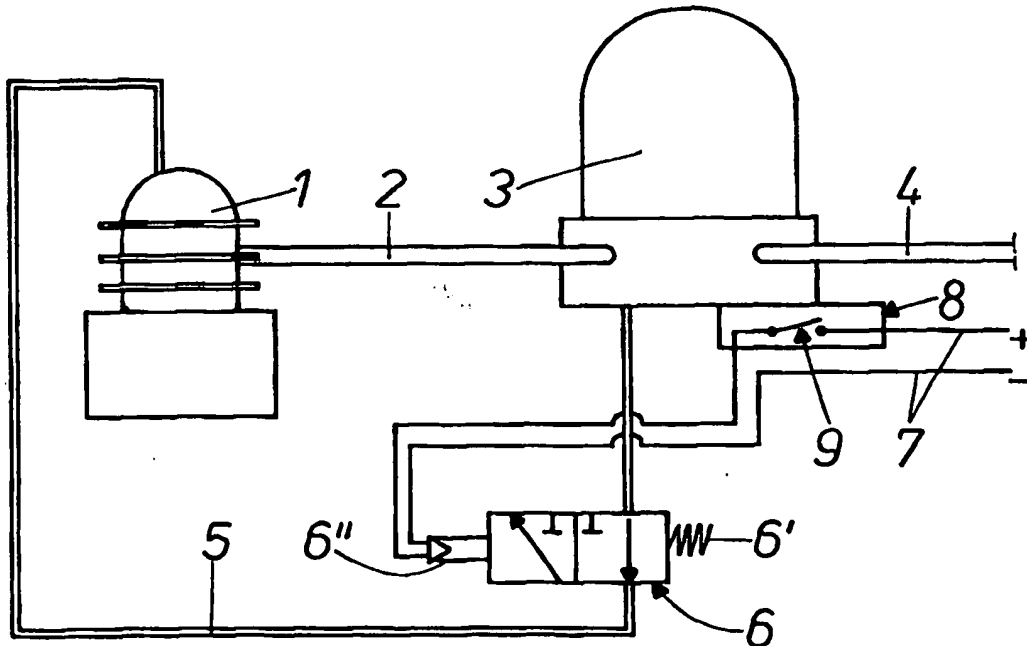


## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(21) International Application Number: PCT/SE98/01170 (22) International Filing Date: 17 June 1998 (17.06.98) (30) Priority Data: 9702353-5 19 June 1997 (19.06.97) SE (71) Applicant (for all designated States except US): HALDEX BRAKE PRODUCTS AB [SE/SE]; P.O. Box 501, S-261 24 Landskrona (SE). (72) Inventor; and (75) Inventor/Applicant (for US only): LARSSON, Sven-Olof [SE/SE]; Drottninggården 79, S-261 46 Landskrona (SE). (74) Agents: STRÖM, Tore et al.; Ström & Gulliksson AB, P.O. Box 4188, S-203 13 Malmö (SE).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).  Published With international search report.

(54) Title: AN AIR DRIER ARRANGEMENT



## (57) Abstract

An air drier arrangement comprises an air compressor (1), an air drier (3) and air conduits (2, 4). In order to obtain favourable working conditions for the arrangement under different temperatures there is a switch-over valve (6) in a separate signal air pipe (5) from the air drier to the compressor. This valve is operable between a first position, giving a governor mode for the arrangement, and a second position, giving an unloader mode for the arrangement. The operation of the valve may be governed by a thermostat (9).

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## AN AIR DRIER ARRANGEMENT

### Technical Field

5       The present invention relates to an air drier arrangement, comprising an air compressor, an air drier, an air conduit from the compressor to the air drier and an air conduit from the air drier to an air tank or an air consumer.

### 10       Background of the Invention

It is generally known that it is important to keep the inlet temperature to an air drier within a certain span, for example +4 - +65°C, but actually as low as possible. In many applications, when a so called governor  
15       mode for the control of the arrangement is used, this leads to problems with freezing in the air conduit between the compressor and the air drier.

Namely, in the governor mode the air flow stops, when the compressor is unloaded, leading under certain  
20       circumstances to a temperature drop below the freezing point. One advantage with this mode, however, is its energy saving ability.

When on the other hand a so called on-line unloader mode for the control of the arrangement is used, non-  
25       pressurized air blows through said conduit from the compressor and out to the atmosphere via the unloader valve of the air drier, when the arrangement is unloaded.

From an energy conserving viewpoint this system has disadvantages, but said conduit is always kept at an even  
30       temperature, most often above the freezing point also at low temperatures. Further, the conduit and the air drier are blown clean from water that can freeze to ice.

### The Invention

The object of the invention is to combine the  
35       advantages of the two well-known control modes described above. This is according to the invention attained in that

in a separate signal air pipe from the air drier to the compressor there is a switch-over valve, operable between a first position, in which air passes through the valve for accomplishing a governor mode for the arrangement, and a  
5 second position, in which the air pipe from the air drier is closed and the air pipe to the compressor is open to the atmosphere for accomplishing an unloader mode for the arrangement.

In a preferred embodiment the valve is a 3/2 way  
10 valve, which is spring biased to the first position and automatically may be brought to the second position by means of an electrically energized solenoid controlled by a thermostat device.

#### **The Drawing**

15 The invention will be described in further detail below reference being made to the accompanying drawing, in which the single Figure schematically illustrates an air drier arrangement embodying the invention.

#### **Detailed Description of Embodiments**

20 An air drier arrangement shown in the Figure has an air compressor 1 supplying pressurized air through an air conduit 2 to an air drier 3, from which dried and cleaned air is supplied in an air conduit 4 to an air tank (not shown) and further to air consuming devices, for example in  
25 a vehicle, in which the arrangement is mounted.

The compressor 1 and the air drier 3 are conventional and are not further described. The air drier 3 is shown as being of the single-tower type but may alternatively be of the two-tower type.

30 The arrangement shown in the Figure is basically of the known so called governor type, which means that the air flow from the compressor 1 ceases in its unloaded state, i.e. when no further air is needed.

For accomplishing this function there is a signal air  
35 pipe 5 from the air drier 3 to the compressor 1.

By working in the governor mode the arrangement saves energy in that the compressor 1 only works when more air is needed. However, the damp air in the air conduit 2 between the compressor 1 and the air drier 3 may under certain  
5 circumstances freeze with serious consequences for the arrangement.

By incorporating an electrically operated valve 6 in the pipe 5 the arrangement may functionally be converted to work in an on-line unloader mode when needed.

10 In such a mode non-pressurized air is transported through the air conduit 2 from the compressor 1 to the air drier 3 and out into the atmosphere through the unloader valve of the air drier 3. In the unloader mode the arrangement is more energy consuming but keeps the conduit  
15 at a constant temperature preventing the air from freezing. In addition, the conduit 2 and the air drier 3 are kept clean from any water, which can freeze.

The valve 6 is a so called 3/2 way valve and is biased by a spring 6' into the position shown in the  
20 Figure, in which air can be conducted from the air drier 3 through the air pipe 5 to the compressor 1. With the valve 6 in this position the arrangement will work in the governor mode.

By electrically energizing a coil 6" of the valve 6  
25 it is switched over into its second position, in which the portion of the air pipe 5 closest to the air drier 3 is closed and the portion of the air pipe 5 leading to the compressor 1 is open to the atmosphere. With the valve 6 in this position the arrangement will work in the unloader  
30 mode.

The energizing of the valve coil 6" can be performed manually, when the temperature drops under a certain level, but the function can of course also easily be automated. An example thereof is shown in the Figure.

Electric energy is supplied to the valve solenoid 6" through electric lines 7 from the battery of the vehicle (if the arrangement is mounted on a vehicle). The lines 7 are drawn through a box 8 at the underside of the air drier 3 containing a thermostat 9, which is normally open but which closes at a temperature below a certain value, for example +4°C, for energizing the valve coil 6" and thus for switching over from the governor to the unloader mode for the arrangement.

Other possibilities include the provision of a valve with a built-in temperature sensor, for example a bimetallic sensor. It would also be possible to make use of an enclosed fluid, which is very volume-expansive with rising temperature, at the valve.

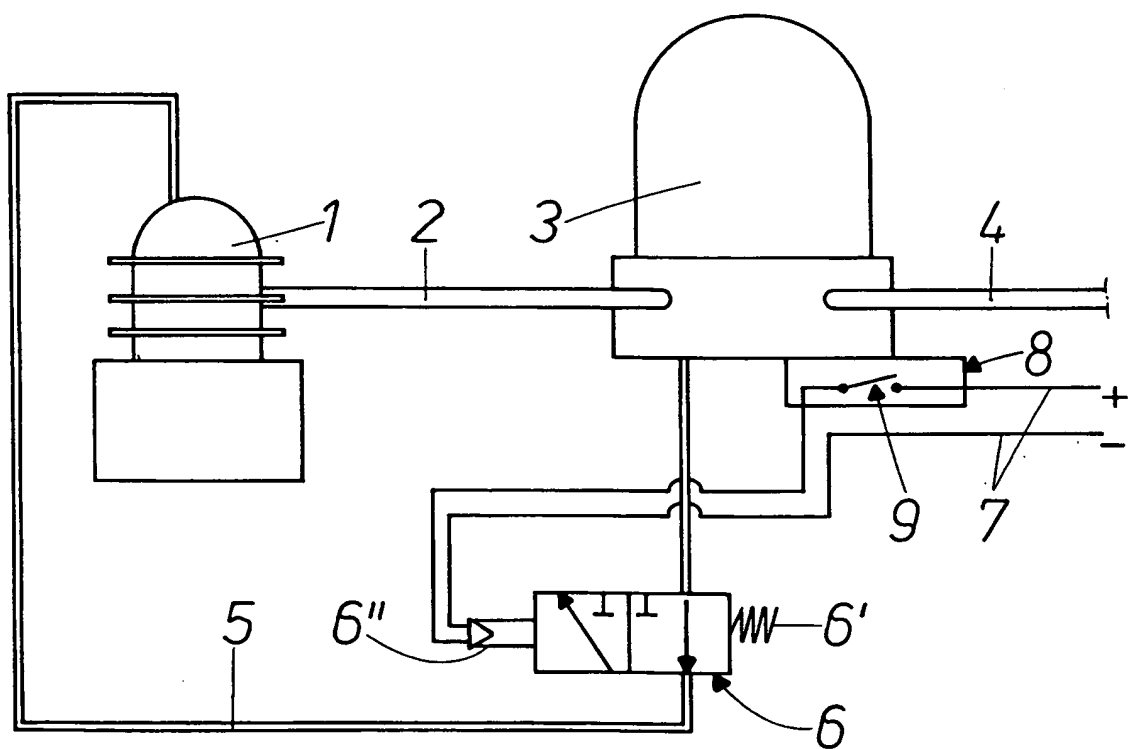
## CLAIMS

1. An air drier arrangement, comprising an air compressor (1), an air drier (3), an air conduit (2) from the compressor to the air drier and an air conduit (4) from the air drier to an air tank or an air consumer, c h a r a c t e r i z e d in that in a separate signal air pipe (5) from the air drier (3) to the compressor (1) there is a switch-over valve (6), operable between a first position, in which air passes through the valve for accomplishing a so called governor mode for the arrangement, and a second position, in which the air pipe (5) from the air drier (3) is closed and the air pipe to the compressor (1) is open to the atmosphere for accomplishing a so called unloader mode for the arrangement.

2. An arrangement according to claim 1, c h a r a c t e r i z e d in that the valve (6) is a 3/2 way valve spring-biassed to the first position.

3. An arrangement according to claim 2, c h a r a c t e r i z e d in that the valve (6) may be brought to the second position by means of an electrically energized solenoid (6").

4. An arrangement according to claim 3, c h a r a c t e r i z e d in that the energizing of the solenoid (6") is governed by a thermostat (9).





## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 98/01170

## A. CLASSIFICATION OF SUBJECT MATTER

IPC6: B01D 53/26

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: B01D, F04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 9116224 A1 (ALLIED-SIGNAL INC.), 31 October 1991 (31.10.91)  --	1-4
A	SE 465631 B (ROBERT BOSCH GMBH), 7 October 1991 (07.10.91)  --	1-4
A	EP 0350215 A2 (BENDIX LIMITED), 10 January 1990 (10.01.90)  -- -----	1-4

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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